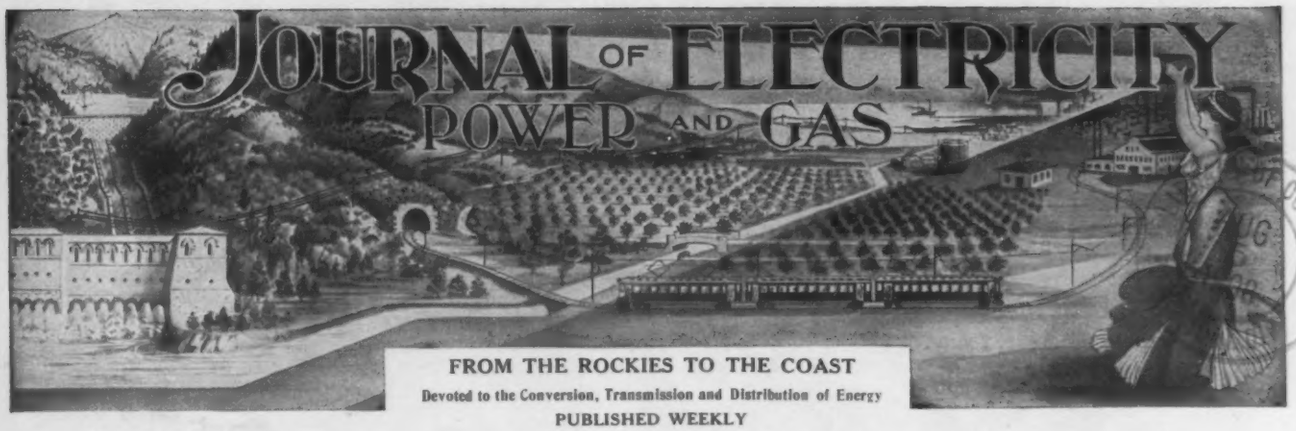
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POWER AND GAS
FROM THE ROCKIES TO THE COAST
Devoted to the Conversion, Transmission and Distribution of Energy
PUBLISHED WEEKLY

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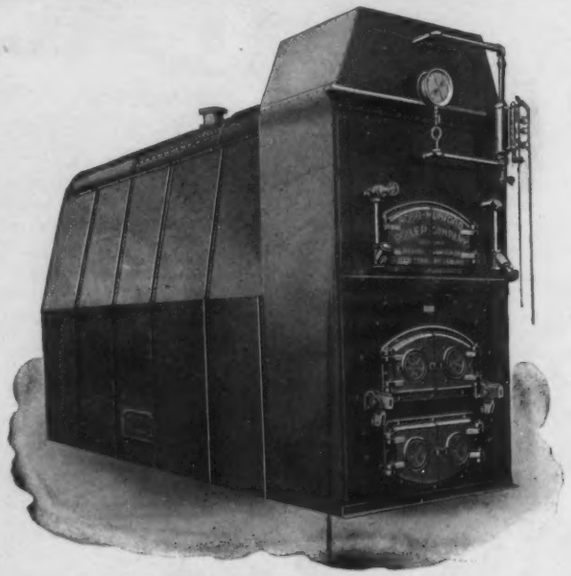

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Journal of Electricity, Power and Gas

Devoted to the Conversion, Transmission and Distribution of Energy.

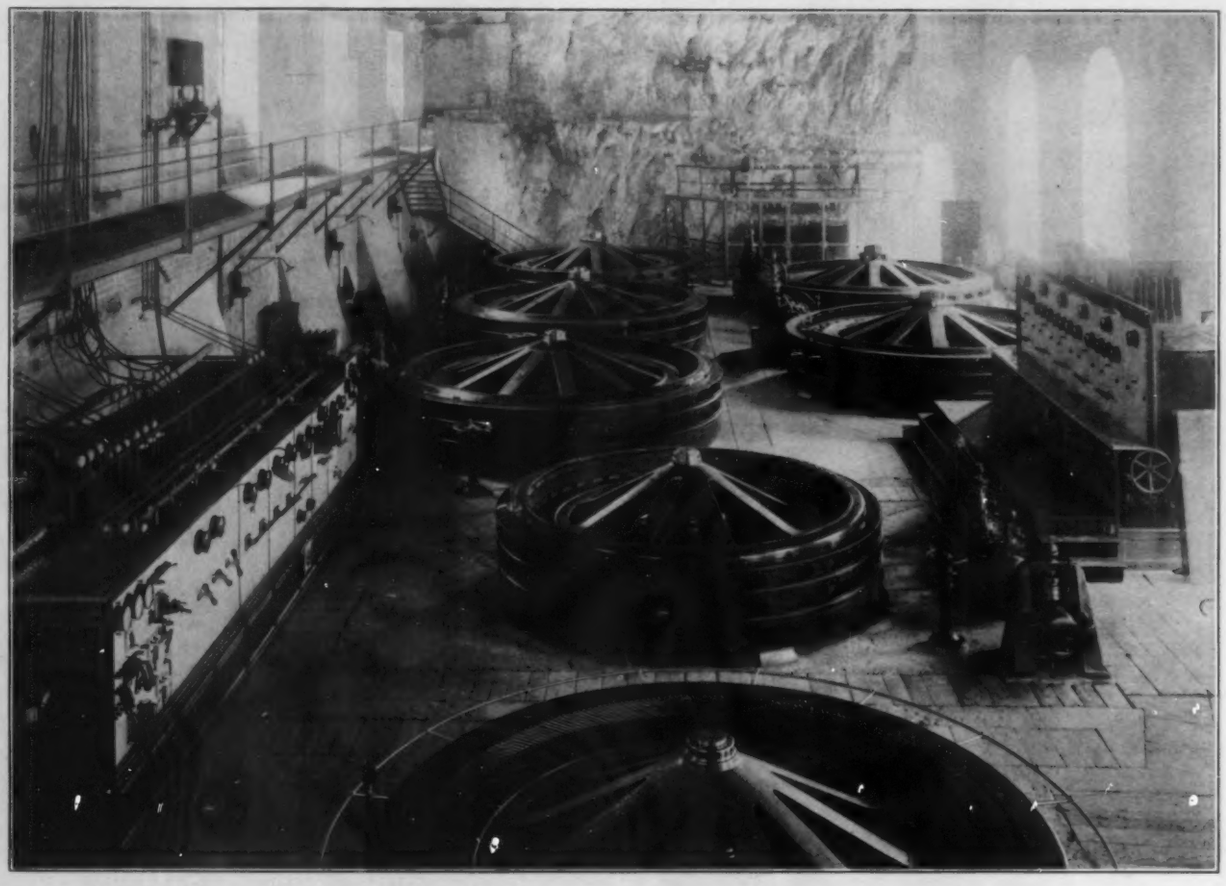
VOLUME XXI. SAN FRANCISCO, CAL., AUGUST 1, 1908 No. 5

THE BELLEGRADE DIRECT CONNECTED HYDRO-ELECTRIC PLANT.

Direct coupling of turbines and alternators is far more satisfactory in hydro-electric plants using vertical turbines than gearing or belting, the latter system of transmission of power from wheels to alternators not being employed to any great extent in modern installations, only exceptionally low head, and therefore very low speeds, making this necessary. Among the excellent examples of hydro-electric stations of large capacity using direct connected vertical turbines and generators is the Bellegrade plant noted in the accompanying illustrations and drawings.

power from the river Rhone has been utilized for many years for industrial purposes at Bellegrade, fifteen miles below Lake Geneva, wire rope transmission being employed exclusively until the power transmission by electricity was provided, insuring a more economical way of utilizing the available energy and distributing the same to the various factories and mills in the vicinity.

The current is generated by direct coupled vertical alternators, a separate exciter for each machine being utilized, driven by a small turbine, also of the vertical type. There



BELLEGRADE 10,000 H. P. VERTICAL TURBINE HYDRO-ELECTRIC PLANT.

The Bellegrade power house in Switzerland is equipped with vertical turbines and generators having a total capacity of 10,000 horsepower, the power being utilized in the numerous factories in the vicinity. On this account a low voltage was used and a frequency of 47.5 cycles per second. The Rhone Land & Water Co., Ltd., originated the first plan for the power station, the electrical work being installed by Brown, Boveri & Co., of Baden, Switzerland, and the hydraulic work by Escher, Wyss & Co., of Zurich.

The latest development of this hydro-electric plant is due to the Societe Francaise des Forces Hydrauliques du Rhone, this company having been originated by the Societe Franco-Suisse pour l'Industrie Electrique de Geneve. The water

are therefore eight direct current turbo-dynamos supplying exciting current to the fields of eight turbo-alternators which generate the current for use on the power distribution circuits. The water is conveyed from the river Rhone to the turbines partly through a tunnel driven in the same rock on which the plant is built and partly through pipes. Sluices placed on the connections between these pipes and the turbines enable one, if necessary, to cut off water from the works.

Both the turbines driving the alternators and the exciter turbines are of the Francis type, operating under a total fall of thirty-six to forty-six feet. The flow of water for the alternator turbines is 482 cubic feet per second, and for the exciter turbines thirteen cubic feet per second, the former operating

at 114 revolutions per minute and the latter at 450 revolutions per minute. The feed pipes have a diameter of 7½ feet. The vertical shaft of the turbine is coupled direct to that of the electric generator, the weight of the magnet wheel of the alternator being carried by the thrust bearing of the turbine. This turbine is placed 16 feet above the tailrace, has 29½ feet head of water and works with full opening which greatly helps to relieve the thrust on the bearings. The running wheel, guide blades, and regulators of the alternator turbines are enclosed in a wrought-iron shell, while those of the exciters are enclosed in cast-iron.

The regulation is obtained through moving blades, these being worked in the large turbines by a system of levers, shafts and rods driven by a hydraulic motor, the distributing apparatus of the same being designed so as to enable it to be run direct from the regulator.

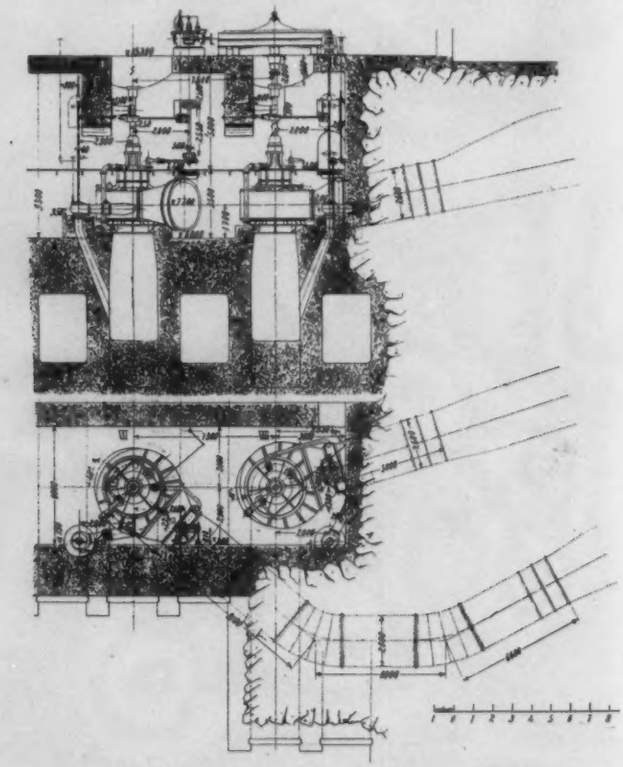
VERTICAL EXCITER.

According to the action of the regulator, hydraulic pressure supplied by a tank is admitted to one side or the other of the piston of the motor, its motion thus causing the regulation of the turbine. The turbines of the exciters are hand regulated. One of the three-phase generators has an output of 800 horsepower at a speed of 133 revolutions per minute, and supplies a three-phase current with a tension of 1000 volts and a frequency of 47.5 cycles, while another has a capacity of 1200 horsepower at 114 revolutions per minute with pressures of 1000 to 1200 volts. There are also generators of 1500 and 900 horsepower at speeds of 114 and 130 revolutions per minute respectively, the pressure of the three-phase current generated being in each case from one to two thousand volts with a frequency of 47.5.

The exciters for these machines include one direct current dynamo of 30 horsepower at 450 revolutions per minute and 110 volts, and another of 40 horsepower at 450 revolutions per minute and 110 volts. The other two exciters both generate a direct current at 110 volts at 450 revolutions per minute, their capacity being 40 to 50 and 30 horsepower respectively.

The main feature of the 1500 horsepower generators is their umbrella-shaped magnet wheel rotating in a horizontal plane. In such cases the magnet wheel usually carries a spider frame, the arms of which extend above its plane and end in a trunnion ring, thus forming a guide for the free end of the armature shaft. But it is claimed that from a mechanical point of view this design has many disadvantages and was avoided in the umbrella-shaped magnet wheels, the arms of which converge straight up from its plane to the upper boss of the armature shaft. A guide-bearing can thus be fitted on the star-shaped pedestal supporting the lower bearing and the armature in the same plane as the latter, its position allowing it to take up directly any magnetic pull which might arise. This device also affords the shaft enough guidance to prevent any oscillation of the free upper end of the same.

When the installation of this plant was first started, vertical shaft turbines were chosen, as at that time turbine makers had not yet progressed so far as to be able to attain for



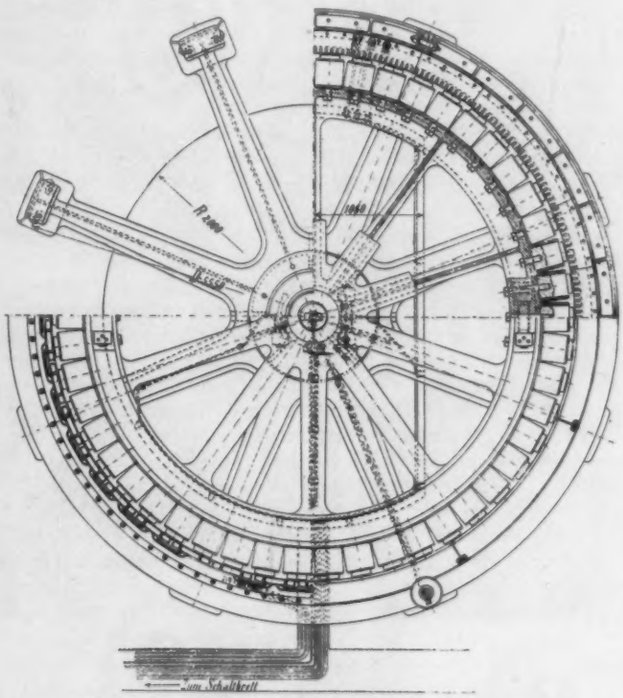
TWO 1500 H. P. TURBINES FOR ALTERNATORS AND TWO 40 H. P. TURBINES FOR EXCITERS.

heads up to sixty feet the results which can be obtained today with the fast-running reaction turbines.

Two halves of cast iron are bolted together to form the magnet wheel which carries on its rim fifty wrought-iron poles. The pole shoes are solid and form one piece with the poles, each pole having its own winding, which consists of copper strip wound on edge on a mandrel, the successive turns being insulated from one another by means of varnished paper. The armature frame consists of two solid halves of cast iron which are placed one above the other and serve to press together the laminated iron discs which receive the windings. The armature winding comprises 3x25 coils, each of which is wound through four holes in the armature core with four turns in each hole and carefully insulated with micanite tubes. The slip-rings which supply the magnet field with the current from the exciters are fixed on the armature shaft right under the bearings. A hole bored in the shaft between the slip-rings and the boss serves as passage for the leads to the field windings.

The alternators were guaranteed as having an efficiency of the generator and exciter at full load and power factor of

unity of 93 per cent, while with a power factor of .8 the efficiency falls to 91 per cent. The drop of voltage between no load and full load running at constant speed and with constant excitation, the power factor being 1, does not exceed 6 per cent, and with the power factor of .8 is at the maximum 20 per cent. The increase of temperature above the surrounding air does not exceed 45 degrees. It has been shown in tests that the drop of voltage is in reality smaller than what had been guaranteed. After running for four hours under a load of 1200 horsepower, the increase of temperature of the machine above that of the surrounding air was scarcely 19 degrees C. The efficiency of these 1500 horsepower alternators at full load was found to be with a power factor of one, with excitation, 94.6 per cent, and without excitation, 95.2 per cent. When the power factor was .8 with excitation the efficiency was found to be 93.3 per cent, and without excitation 94.7 per cent.



1500 H. P. ALTERNATOR AT BELLEGRADE PLANT.

The switchboard equipment is mounted in two different groups on each of the two longer sides of the engine room, corresponding to the two different periods during which the plant was constructed. The first switchboard carries seven panels, of which the first corresponds to the 800 horsepower, the second to the 1200 horsepower, and the third to the 1500 horsepower alternators respectively. The remaining four correspond to the 1000-volt feeders.

The second switchboard is of a more recent design and is divided into six panels, of which five correspond to the alternators and the sixth is used to parallel both switchboards. The switchgear is mounted on iron framework carrying marble panels, on the front of which are fitted the low-tension gear and cut-off switches. The four 1500 horsepower alternators, as well as the 900 horsepower ones, are designed so as to enable one by changing over their connections to obtain either 1000 or 2000 volts direct from the windings.

The latter voltage is used for feeders which connect the electric supply station with distant points. The new switchboard is therefore supplied with a double system of bus bars, one being reserved for the 2000-volt feeders. The voltage is regulated by means of rheostats connected in series with the magnet windings of the alternators. Their driving gear is connected with those of the rheostat which keeps the load on the exciters constant. By this arrangement the tension is kept constant and also the speed of the turbines.

HYDRAULIC POWER AND CENTRIFUGAL PUMPING MACHINERY.

By E. N. Percy.

Both of the above-mentioned types of machinery are of growing importance to the practical engineer and mechanic. While the steam and gas engine may never be supplanted by hydraulic power, nor the reciprocating pump by the centrifugal, still both types of hydraulic machinery are making such rapid strides that every practical man should be as well informed as to their principles as the progressive man is of steam turbines. The value of water power has always been known, but the advent of new and efficient types of hydraulic turbine and wheels, and the development of long-distance power transmission lines for electricity, cheap hydro-electric power promises to become one of the mainstays of civilization.

Water rights are eagerly sought on the frontiers of advancing modern engineering in all parts of the world. In our country they are bought up and bargained for decades before any possible use could be made of them.

The government is taking steps to control water rights and power among other national resources concerned in the present movement extending all over the country. Most parts of the country are within the reach of cheap water power, allowing for a steady growth in the possibilities of long-distance electro power transmission. The industries that have centered around Niagara Falls and Sault Ste. Marie speak for themselves. Some require only power, others electricity for metallurgy, secret processes, cooking and illumination.

A very small stream with a great fall, or a very small fall in a large river, can give immense amounts of power. Our coal supply is visibly decreasing, while the demand is increasing at a tremendous rate. The coal used each decade up to 1908 has exceeded all the coal mines in this country previous to that decade. Electro-metallurgy and electro-chemistry are making great strides, and we may hope to see our smelting and some chemical work performed by electricity, which alone will save a large percentage of coal mined.

Besides this, minor industries of importance have arisen of late years, calling for electric welding, electric power, electric furnaces, the manufacture of fertilizers, calcium carbide, to say nothing of the enormous systems of electric railroads and trolleys and the increasing use of electricity in the home. These all tend towards the cheaper production of power by hydraulic machinery.

Also the field of the centrifugal high duty pump is growing every day. Huge isolated stations are now applied to irrigation, land drainage and reclamation, such as the recovery of marshes, lake beds, deserts, etc. The business of dredging is growing fast, and a dredge is but a huge power plant for pumping, with additional machinery for pulling itself around. In small work they have been successfully substituted for all kinds of reciprocating pumps, except extreme high pressure for hydraulic press work. Aside from many obvious advantages, they have the special one that the discharge valve may be shut tight and no harm results nor does the pressure rise. They are of special use in pumping sewage, gritty water, bilge water, ejecting ashes, etc., and have been experimented with in the handling of coal with fair results.

The operation of a centrifugal pump is not a difficult matter for a practical mechanic and engineer. Whether driven by belt, electric motor or steam turbine, the power end must be treated as a separate factor. The points of the pump requiring reasonable examination and care from time to time are the bearings, the stuffing box, the inside throat bushing, and the rubbing points on the casing.

The bearings must line up so that the runner does not touch the casing. The runner should run true and be balanced. The bearings are subject to the same treatment as any high-speed bearing. The throat may or may not be bushed. In cheap pumps the throat is made very long and

constitutes the only bearing. It may be bushed with babbitt, brass, bronze, lignum vitae, or self-lubricating metal. In some cases the water will give sufficient lubrication, particularly with lignum vitae or babbitt. In other cases grease must be forced in. When the water is very gritty, a jet of clear water is led to a lantern in the throat bushing, which keeps the grit out. The thrust of the runner must always be taken care of, either by a thrust bearing or by some automatic balancing device on the runner, as it is not possible to design a runner perfectly balanced for end thrust, although a double suction runner is balanced most of the time.

The care and operation of a high-speed, high-power hydraulic plant is more complicated, especially when the electric generating plant is considered. It requires a skilled mechanic and engineer to maintain, as the speeds are very high, the workmanship fine, and the responsibility great. A Pelton or Doble type wheel of 10,000 horsepower, built for very high head, is less than six feet in diameter. It must be perfectly balanced; the buckets are polished, and the governors work with astonishing accuracy. It is a common thing for buckets to fly off of these wheels, doing great damage. This, while partly a matter of design, is largely a matter of workmanship and balance.

The points of mechanical interest about these plants are, first, the type of wheel which varies from the submerged low head turbine with draft tube up through many different types to the above-mentioned high-head, high-speed impulse wheel. The Niagara and Sault Ste. Marie turbines are of the low-head submerged type. They work in a vertical position, and the runners rest in a thrust bearing which is a study in itself, as, when running, the water is supposed to support the runner. The shafts are hollow castings and are very long. These may be taken as a type of the highly developed low-head installation.

The high-head wheels are merely a series of buckets of well-known general form, but differing greatly in details of design, placed around the periphery of a turned disk of steel.

The nozzles from which the water comes may be one, two or three in number; usually one in a high-power plant. They may be governed by swinging to and from the buckets, by a needle inside, by a deflecting plate, or by a plain gate. The needle nozzle is the accepted method of governing for high efficiency. This has been brought to a high state of perfection by several firms and is found to have a fairly constant velocity for all positions of the needle.

The needle is usually controlled by a hydraulic cylinder, which, in turn, is controlled by the governor. There are many hydro-electric governors, and rather than go into so extensive a description, it is better that the practical man take up the study of any one type with the makers, as the first thing that the engineer of a hydro-electric station must do is to thoroughly conquer the governor, as here lies 90 per cent of all the troubles of operation. Usually in connection with a shut-off or a needle nozzle another release opening is provided which opens as the nozzle closes, and then closes slowly by means of a dashpot. This prevents sudden shocks to the high-pressure mains by too sudden action of the governor, as is shown by the following experience. At a well-known hydro power station in California a large unit or group of units was running under full load. There were no relief valves or other safety devices in connection with these units, and the large mains under some hundreds of feet head came down a steep slope directly back of the power house. In some way, at a distant point, the entire load on the transmission line was cut off, either at the switchboard or by accident to the rotary converters. This cutting out at full load is a dangerous thing for high tension electrical apparatus and can result in its total destruction. However, all of the governors answered instantly. The enormous inertia of the water parted the mains above the power house, flooding and filling it with debris and ruining much of the equipment.

As with all high speed machinery, the wheels should be started slowly, manipulating the gate much as a throttle until the governor takes hold. Then the wheel can be synchronized by varying the governor adjustment, which is usually provided for. This should be done with the same care as a steam plant, and the load cut in on an ascending rather than a descending variation of speed.

Wherever there is no clear way for the jet from a swing nozzle or escape nozzle, a baffle plate of heaviest construction must be provided, as the jet will wear its way through concrete or rock foundations or anything that can be put before it except renewable plates. It is well to give great care and attention to the pipe or penstock. Its joints, anchorages, rivets, fittings and thickness should be watched. Any movement, however slight, should be watched and provided for, before a joint or head connection gives way.

These plants are usually provided with self-oiling bearings, as lubrication is a very important feature. The bearings cannot be allowed to go for weeks, like dynamo bearings, but should have new oil every day, and the old oil inspected and filtered if necessary, as with the least trouble, at the high speeds used, an expensive bearing surface is ruined in a few seconds. The reason is that in addition to the high rubbing speed, the bearing presents the sum total of reaction forces to balance the force of the jet on the buckets when the jet is on one side only.

This could be much reduced; in fact, theoretically it would be zero except for the weight of the shaft, if a jet were on each side of the wheel. But certain difficulties of design preclude this idea in high-duty wheels. Some wheels have been designed with self-oiling bearings in which the oil constantly circulated from one to the other, then to a cooler and reservoir and back. Others have absolute forced lubrication, maintained by a pump. This gives fine results, but the old objection to this system is if the pump fails, even for a few seconds, the bearing is damaged. In addition, the bearings and caps are made hollow, with cold circulating water running all the time. This is a very good practice and could only be improved upon by having the water emerge visibly from each bearing and drop into a drain funnel, that the attendant may see it, feel it, and thereby know the condition of the bearing.

The headgates, located at the head of the penstock, are often operated by electricity and controlled from the power house. As this apparatus involves some little complication, it is well to understand it and know just how it is working at all times, it being the final resort to shut off, in case of a bad breakdown. In connection with this, it is often the custom to run an entirely separate small water-wheel and dynamo to supply light and power for the plant and vicinity, being more independent and less costly than high-tension transformers, etc.

The generators, power line and details of switching are a specialty by themselves, and the hydraulic man is not supposed to have a thorough knowledge of them, although he can, by application, soon obtain sufficient knowledge for proficiency in their operation. In fact, first-class engineers or electrical men soon learn to care for all the details of a hydro-electric power plant. But to the novice it is uphill work, entailing more responsibility than such men generally receive, especially as the plants are isolated, repairs difficult, and a man must often act on his own judgment. The facilities for repairs are meager. The most necessary repairs, aside from accidents, are attention to bearings, stuffing boxes, gate valves, baffle plates, and replacing of worn buckets and nozzle tips, the latter at long intervals only.

The loads usually vary a great deal and keep a man jumping at the governor unless it is working very fine. In addition to governor regulation, the difficulties of holding machines in synchronism are increased by electro-technical troubles, known as surging in the power line, where the alternations build up in great waves of density and rarification, and surge just as a water hammer in a pipe. Also with street car

lines, lighting circuits, industrial plants, etc., the power variations are very great. At times it will go from 60 per cent at 5 o'clock p. m. to 10 per cent at 6 p. m., and up again to 90 per cent or 100 per cent at 9 p. m. The operator must learn to anticipate the load so as to have the proper number of units in operation. The effect of gritty water on hydro plants is usually over-estimated and is talked of more in the drawing room than by practical operators.

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ADDITIONAL NOTES ON THE MEETING OF THE NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION.

The eighth annual convention of the National Electrical Contractors' Association opened at the Auditorium Hotel, Chicago, on July 16th. While the attendance was not up to that of previous meetings, it was enthusiastic and the session was a profitable one. Two features of the open meeting proved of great interest. They were the papers read by Geo. Loring, of the National Lamp Co., on "The Electrical Contractor's Opportunity in the Electrical Field," and that of W. H. Merrill, Jr., of the Underwriters' Laboratories, Chicago, who took for his subject, "The Relations between the Underwriters and the Contractors." Both papers drew forth discussion, which proved of great interest.

On the afternoon of the 16th the contractors and guests, to the number of about two hundred, attended the ball game between the New York "Giants" and the Chicago "Cubs," which terminated to the entire satisfaction of the Eastern contingent. The night of the 16th was set aside for the rejuvenation of the Sons of Jove. About fifty new members were initiated, the entire affair being handled in a manner highly creditable to the Chicago members who had charge of it. Following the rejuvenation, a banquet was given at which two hundred and fifty members were seated, W. E. Robertson, of Buffalo, Jupiter of the Fifth Congress, presiding as toastmaster.

In the course of the banquet, Mr. Robertson spoke highly of the good work of the Order on the Pacific Coast, his remarks being responded to by E. M. Scribner, who, on behalf of the Coast members, extended an invitation to the entire Order to visit that section and enjoy the hospitality for which it is famous.

One pleasing feature of the rejuvenation was the music furnished by the San Francisco band, composed of H. E. Frosch, pianiste, and E. M. Scribner, bass drummist. The "thunder effect" given by the bass drum was particularly fine.

The convention closed with a day's outing at Michigan City, Indiana, on the 17th. The entire party was transported in a special steamer, and upon their arrival athletic contests took place which would have made the ancient Greeks turn green with envy or with shame. The particular feature which attracted attention was the ball game between the contractors of the East and West, in which the former won by a score of ten to seven.

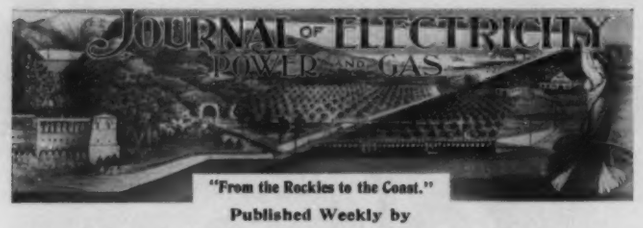
In the election of officers for the ensuing year, E. M. Sanborn, of Indianapolis, was chosen as president to succeed James R. Strong, of New York. W. H. Morton, of Utica, N. Y., and John Galloway, of Washington, D. C., were re-elected as secretary and treasurer respectively.

Toledo, Ohio, was chosen as the place for the next annual meeting, and July 21, 1909, was the date set.

HEATING, ELECTRIC.

"G. E." pressing irons, Type F, 95-250 V. Three, six, eight, twelve, fifteen, eighteen and twenty-four pound sizes, supplied with approved attachment plugs, cord and G. E. stands. It should be noted that as yet no adequate means have been brought forward for eliminating certain hazards incident to the use of electric pressing irons, and records show that such devices left with current "on" are causing comparatively frequent losses. The general design and workmanship shown in the construction of these G. E. irons and accompanying stands were approved June 10, 1908. Manufactured by

General Electric Co., Schenectady, N. Y.



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HYDRAULIC POWER.

A clear understanding of the fundamental principles underlying the action of hydraulic machinery is essential to every engineer. These principles are so simple and so easily comprehended that they form the basis of many analogies in the explanation of more involved phenomena. Hydraulics deals with water in motion. The power developed by moving water depends upon its weight and velocity, which is found from the volume and the distance through which it has moved. Hydraulic machinery may be classed under two general heads: machines which move water, and machines which are moved by water. The second class includes not only water wheels and turbines, in which the action of the water is largely due to kinetic energy, but also those devices in which the static pressure of water is employed to do useful work.

Nature's greatest force is that exerted by solar energy. Whether available in plants as food, in the earth as fuel, or in the air as potential electricity or hydraulic head, the heat from the sun is the source of man's every power. It is not surprising, therefore, that the ancients worshiped the sun as a god. It supplies the heat to vaporize the water and then raise it to great heights as clouds. They act as storage reservoirs until condensation takes place on the mountain sides. Like many other forms of energy, its utilization is inefficient. Means of harnessing the energy liberated by the condensation of water in the atmosphere are yet to be devised. Its strength is occasionally made manifest in the lightning; its beauty in the aurora; but the wisdom of man has yet been unable to control the great potentialities continually being dissipated without accomplishing anything. Opposing the sun's force in many respects is the force of gravity. The sun's power is positive. That of gravity is negative. For gravity pulls down what the sun's rays have raised. While these two forces are universal, yet they do not become available for the production of water power without the instrumentality of topographic relief. By its means the feeble efforts of tiny streamlets are concentrated into the great power of mighty rivers. It also gives to water the head by virtue of which power is developed. A small quantity of water under a great head is just as powerful as a great quantity under a small head.

For countless ages the tremendous energies of the world's water power ran riot. They did nothing except wear away the surface of the earth and dash themselves in futile spray. The kinetic energy of the waterfall was an unknown possibility until man tried to restrain it. Then it was found that hydraulic power could be obtained by interrupting the great cycle through which water is continuously moving. This motion is as near to being perpetual as any that man can use. "It is as old as the hills," as eternal as the sun, and as ceaseless as the law of gravitation.

CORRESPONDENCE.

WATER POWER DEVELOPMENT IN FOREST RESERVES.

The Editor.

Sir: Regarding the paper by F. G. Baum recently published in your periodical, it was a timely article from the standpoint of the hydro-electric power company. It would be rather interesting to hear the government's side as to why power companies should be treated differently than any other industry in the United States. They seem to have restrictions imposed on them at present that no other industry is harassed with.

Take it in the matter of pole lines. If the power company wishes to operate in a country where it is necessary to run a pole line over government lands, they can get no permanent right of way, even if not in any reserve, but simply a permit which is revocable at any time the government sees fit to do it. At present where there is government land it generally means that the land is very poor in quality, or too dry, the country is thinly settled and poorly developed, and, therefore, the power company has not a very good field in which to operate. This holds especially true in Nevada and a few of the adjoining States.

Under such conditions anything that would improve the country should be encouraged, but it certainly takes a good deal of courage to put in vast sums of money on pole lines which simply have value while the Government is willing to have it so. A pole line generally costs more than an irrigating ditch, but every effort is made to encourage the building of irrigating ditches, and a permanent right of way is issued by the Government for this purpose, as well as for reservoir sites for irrigating purposes.

Power companies also help to conserve water, as mentioned in Mr. Baum's article, by building huge reservoirs. Their power is also in many cases used for irrigating purposes, all of which works in harmony with the Government's policy of developing agricultural districts. This point of view, however, does not appear to be recognized by the Government, but the Government puts everything in such shape that the power company, which has to depend upon a pole line running over Government land, could be wrecked at the pleasure of some Government official. There is probably some good reason why power companies are not entitled to permanent right of way, but the writer certainly cannot see any reason for such a law.

To prove that the trouble regarding permanent rights of way for pole lines is not imaginary, the writer knows of one case where a big power plant was contemplated where all the pole lines had to run over Government land, and the matter was held up several years in an endeavor to try to get a permanent right of way from the Government. According to the latest information, the power company has finally decided to go ahead with the plant, probably owing to some favorable action on the part of the Government. The entire community, however, which would have been benefited by this power company, will have been held back several years owing to this law, and there is quite a demand for power in the field in which they intended to operate, especially as fuel is very scarce and expensive.

F. O. BROILI.

Reno, Nevada, July 27.

TRADE NOTE.

The Kellogg Switchboard and Supply Co., under the management of H. C. Goldrick, has removed its Pacific Coast office and stock from Los Angeles to San Francisco, occupying the entire second floor of the new fireproof building, corner of First and Mission Streets. C. F. Hartung, formerly assistant sales manager, is now in charge of the southern territory, with headquarters in Los Angeles, and C. J. Langdon in charge of the northwestern territory, with headquarters in Portland.

PERSONAL.

George W. Edge, of the Van Nort Company, of St. Louis, is in San Francisco.

William Locke, of the Hazard Mfg. Co., Wilkes-Barre, Pa., has been visiting San Francisco.

Richard Spencer, general manager of the California Electric Company, of Los Angeles, has left for a trip East, after a brief visit to San Francisco.

E. J. Koppitz, formerly of New York, has joined the San Francisco sales force of the Western Electric Company, handling motors, generators, transformers, and other heavy material.

W. A. Blair, of the Western Electric Co., has been elected vice-president and a member of the Executive Committee of the Jobbers' Association, of San Francisco, vice R. W. Van Valkenburgh.

James W. Gladstone, formerly proprietor of the Battery Supplies Co., of Newark, N. J., is now acting as European agent for the R. Thomas & Sons Co., East Liverpool, Ohio, with headquarters at 25 Victoria Street, Westminster, London, S. W.

President R. B. Benjamin of the Benjamin Electric Mfg. Co., Chicago, has gone to London, England, for the purpose of establishing a branch office and factory for manufacturing and handling their Wireless Clusters and Lighting Specialties abroad. He is accompanied by Mr. B. J. Grigsby of the Engineering Department who will be left in charge upon Mr. Benjamin's return. A stay of from four to five weeks is contemplated.

TRADE CATALOGUES.

The Chicago Fuse Wire & Mfg. Co. sends an illustrated price list of "Union" switch boxes, outlet boxes and covers, that will interest every electrical contractor.

The Western Electric Company has completed the compilation of an immense Supply Catalogue that includes all electrical apparatus and supplies in ordinary use. This volume contains 834 pages, 7x10 inches, and is handsomely bound in blue and red boards. In it are given illustrated descriptions with code words, sizes and prices of the great variety of electrical apparatus sold by this company. It is a most valuable reference book for telephone and lighting wiring. A number of useful tables are also included.

The General Electric Company, Schenectady, N. Y., has issued a new bulletin on Thomson Astatic Instruments for Continuous Current Switchboards. These instruments are extensively used, and have a reputation for reliability and accuracy regardless of external influence. They have no controlling springs, and their accuracy is not affected by changes in magnet strength. The damping effect in these instruments is produced by an aluminum disk moving in a magnet field, and the indications are dead beat. The bulletin describes voltmeters and ammeters of the feeder board and illuminated dial types, and gives complete dimension diagrams.

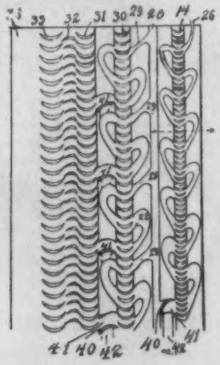
TRADE NOTE.

The Sprague Electric Company has recently opened another branch office on the Pacific Coast. The San Francisco office is now supplemented by one in the Colman Building, Seattle, Wash., in charge of Mr. W. R. Hendrey, who is well known in the electrical field on the Coast.

PATENTS

STEAM-TURBINE. 893,127. Guy M. Barber, Falconer, N. Y.

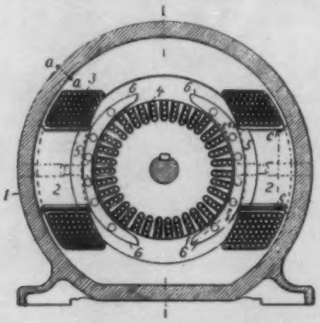
In a rotary engine, a casing having a central chamber, a turbine wheel rotatably mounted in said chamber, a nozzle for



the motive fluid in said casing, an adjustable leaf spring within the opening in said nozzle, said leaf spring formed in two parts with a central lengthwise lap and angular sides, and a set screw to adjust said leaf spring to increase or diminish the size of said opening.

DYNAMO-ELECTRIC MACHINE. 893,228. Gano S. Dunn, East Orange, N. J., assignor to Crocker-Wheeler Company, Ampere, N. J.

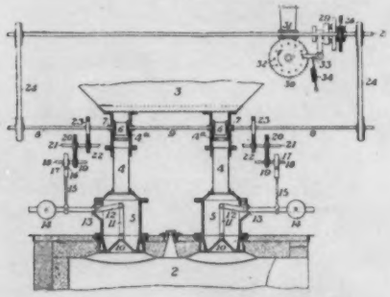
A dynamo-electric machine having a toothed armature and an air gap between the armature and field with graduated terminal sections wherein the reciprocal of the square of the air-gap length bears a constant ratio to the distance along the



armature periphery from a fixed point and wherein the gap is further increased near the wider ends to effect throughout each terminal section a change in the square of the magnetic flux which bears a constant ratio to the distance along the armature periphery from said fixed point, each terminal section being extended over an arc which is the same as that embracing several teeth.

APPARATUS FOR FEEDING FURNACES. 893,432. William H. Bradley, Bellevue, Pa.

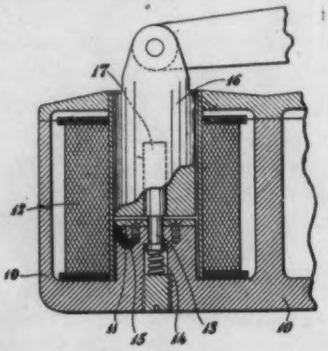
In furnace feeding apparatus, a fuel passage, means for delivering charges of fuel to passage, a constantly rotating member actuating means therefor, mechanism for actuating the delivery means, actuating connections between such mechanism and the constantly driven member, a clutch for controlling the actuating connections, and a governor actuated by



the constantly driven member and having connections for controlling the clutch, said governor being arranged to effect the periodical actuation of the clutch a plurality of times during each revolution of the controller.

ELECTROMAGNET. 893,305. Herbert W. Cheney, Norwood, Ohio, assignor to Allis-Chalmers Company.

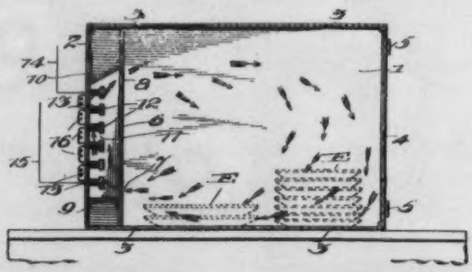
A solenoid electromagnet comprising a winding, an iron frame extending partly within said winding, and a movable



core, said inward extension and said core having plugs of higher magnetic retentivity to hold the core in attracted position after the magnet is de-energized, one of said plugs being spring-mounted.

ELECTRIC HEATING APPARATUS. 893,015. William H. Ripley, Bloomfield, N. J., assignor to the Prometheus Electric Company.

A device of the character described, including a closed chamber, means of access thereto, an auxiliary housing within



said chamber, passages between said chamber and housing, and heating means mounted in said housing and comprising a plurality of electrical resistance bars mounted on insulated lugs.

INDUSTRIAL

A NEW CUTLER-HAMMER LINE.

The Cutler-Hammer Mfg. Co., of Milwaukee, Wis., are introducing a new line of porcelain push-button specialties as illustrated in the accompanying pictures. This line at present consists of pendant switches, surface switches with sub-base, and push-button lamp socket.

Model illustrating **the mechanism** only.

A number of other specialties are in preparation, announcement of which will be made from time to time.

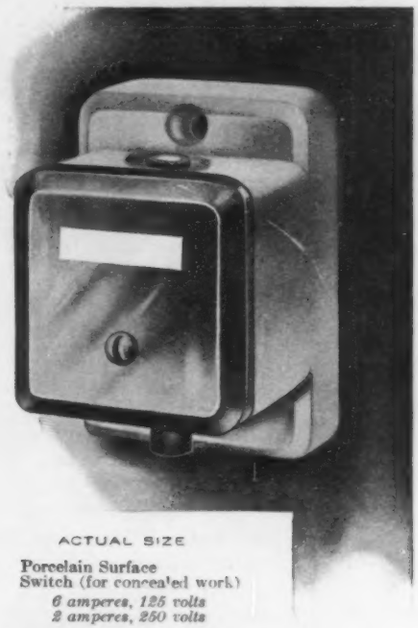
The push-button mechanism used in these devices can be adapted to many uses—to almost any use, in fact, where a quick make and break is desired. The mechanism consists of but three moving parts; (1) a push bar extending clear through the switch; (2) a coiled steel spring; and (3) a moving contact piece. These, with the fixed contacts, constitute the whole of the mechanism.

The principle embodied in the Cutler-Hammer switch mechanism (as can be seen in the picture of the model), is that of a coiled spring contracting on a tapering surface—the action being similar to that of a rubber ring slipped over the

Push bar, spring and moving contact piece.

knob of an umbrella, or a coiled wire sleeve supporter, which, when passed over the elbow, will travel a short distance up or down the arm itself. The action is positive and snappy in either direction—in other words, that the mechanism gives a quick "make" as well as a quick "break," the movement of the contact piece being the same whether the push bar is moved fast or slow. These devices have been approved by the Underwriters.

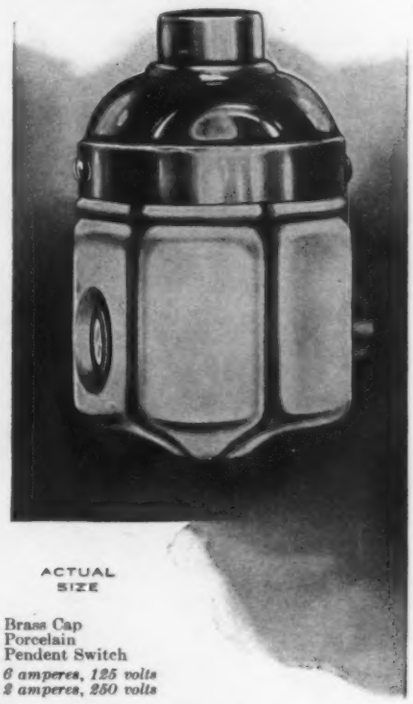
Cutler-Hammer push-button specialties are made of porcelain, which is a non-corrosive and non-conductive material. This means that they will not tarnish like metal switches and sockets, nor can the user possibly receive a shock while handling them, since all metal parts are encased in porcelain. The snappy action of these devices reduces arcing to a minimum, and such slight arcing as does occur is confined to a separate porcelain chamber away from the circuit wires and terminals. Liberal space is provided for knotting the flexible cord, and the removal of a single screw gives access to the interior of the



ACTUAL SIZE

Porcelain Surface
Switch (for concealed work)
6 amperes, 125 volts
2 amperes, 250 volts

Made also for molding work.
Can be furnished in either style with label holder (as shown above) or without label holder.



ACTUAL SIZE

Brass Cap
Porcelain
Pendent Switch
6 amperes, 125 volts
2 amperes, 250 volts

switch, making the wiring of these devices an easy matter. Otis & Squires, 111 New Montgomery St., San Francisco, are the local agent for all Cutler-Hammer lines.

WEBER FUSE PLUGS.

Weber sockets are so well known on the Coast, and have given such uniformly satisfactory service, that any announcement of a new Weber device is most gladly welcomed. We illustrate herewith the new Weber fuse plugs. The simplicity of design, quality of material, and thoroughly first-class workmanship are characteristic of the entire Weber line. It is apparent that the intent of the makers to put on tne market a fuse plug free from the inherent defects of the old style has been realized.

All soldered connections are entirely inside the plug. There is no outside lump of solder to prevent the proper bottoming of the plug in the cut-out, which has always been a most fruitful source of trouble. The cap and screw-shell are fastened to the porcelain in such a manner that it is absolutely impossible for either to turn or become loose. The construction is such that there is no possibility of the escape of molten fuse metal when the fuse blows, but the escape of gas is properly provided for by the large and well-placed vent holes.

These fuse plugs are made for service up to 125 volts in the usual capacities from three to thirty amperes. They are regularly furnished with mica caps, but can be supplied with solid brass caps on special order. The simple announcement that this line is ready, is enough to assure the makers of a large demand from the Coast. Weber fuse plugs are for sale by all jobbers of electrical supplies.

TUNGSTEN ECONOMY DIFFUSERS.

Under the name of the Tungsten Economy Diffuser, the General Electric Company, Schenectady, N. Y., is placing on the market a new form of illuminating device. The Tungsten lamp makes the incandescent unit a competitor for lighting larger areas than was previously possible, and by properly diffusing the light, a very effective and economical illumination is obtained. The special advantages claimed for the Tungsten Economy Diffuser are a wide range of capacity which can be obtained by using different sizes of lamps or by different combinations; a relatively low intrinsic brilliancy with excellent diffusion; and an economical distribution of light in which the maximum intensity is emitted at oblique angles in the lowest hemisphere, so as to illuminate the intermediate spaces, but allowing a small amount of light to be sent above the horizontal and avoid darkness in the upper part of the room.

Bulletin No. 4594, recently issued by the company, describes and illustrates two types of this diffuser, designated respectively as the store type and the mill type. They consist of a broad reflector or diffuser surrounding a frosted globe containing the lamps. They are made for five or six lamps, and can be adjusted for tungsten, tantalum, or carbon filament incandescent lamps in all the usual sizes. A special snap switch has been developed which allows different combinations of the lamps to be made with convenience. The bulletin contains photometric curves showing the light distribution under different combinations, connections, and data as to the different styles manufactured.

WESTERN ELECTRIC AT HAWTHORNE.

It is officially announced that the Western Electric Company, of Chicago, will soon abandon its old Clinton Street works, as well as those at Polk Street and the river, and concentrate all its manufacturing departments in Chicago at the Hawthorne Works, which will be much enlarged to accommodate them. About $600,000 will be spent in the construction of three large buildings and in additions to some of the buildings already erected. Some of the departments at the New York plant will also be moved to Hawthorne.

This important action was taken as the result of careful consideration of the immediate opportunities and future needs of the company. It was believed that the present conditions of diminished activity, inasmuch as they did not tax the manufacturing facilities now at hand, were peculiarly favorable for a re-arrangement, that would be soon needed, of the manufacturing work now carried on at the old plants. By concentrating all the work at the as yet only partly developed Hawthorne Works, there would be realized material advantages in economy of production and opportunities for more systematically arranged future additions.

The new additions to the Hawthorne Works will make it one of the largest manufacturing plants in the country. With a ground area of 150 acres and most excellent railroad facilities for the receipt of raw material and fuel and for the shipment of finished products, these works combine the most modern machinery and methods of manufacturing on a large and economical scale. The principal additions required will be for the telephone department that now occupies most of the old Clinton Street works.

At these old works the company began its manufacturing career on a small scale over twenty-five years ago. Steady growth of the business brought the expansion of the establishment so that it now occupies practically all of the two blocks bounded by Clinton, Jefferson, Van Buren and Harrison Streets. The ground area is about 200,000 square feet, while the combined floor area of the different buildings is close to 900,000 square feet. The plant at Polk Street and the river has a ground area of about 210,000 square feet, with good shipping facilities by both rail and water. The value of these two plants is placed at more than $3,000,000. They have been placed on the market to be sold or leased. The works at Hawthorne are on the western boundary of the city of Chicago. The main office of the works is at Twenty-fourth Street and Forty-eighth Avenue.

OAK MOVING.

As part of its constant effort to beautify the factory grounds at Ampere, N. J., the Crocker-Wheeler Company, manufacturers and electrical engineers, have moved several large trees and replanted them in different locations on the property. On June 11, an oak tree sixty feet high was lifted by means of the Crocker-Wheeler locomotive crane, carried about 200 feet and replanted near the new post-office which is being built on the company's property. The handling of this large tree and the ball of earth in which the roots were imbedded involved a nice calculation as to the center of gravity of the tree. The work was accomplished, however, without mishap. The C.-W. factory is becoming one of the "show plants" of the country.

NEWS NOTES

TRANSPORTATION.

Ventura, Cal.—The Trustees have agreed to advertise for sale a franchise for a street railway, asked for by F. M. Packard and other Los Angeles men.

Boise, Ida.—E. M. Heigho, general manager of the Pacific & Idaho Northern Railroad, announces that extension work is to be carried on to a great extent during the present summer.

Seattle, Wash.—The Columbia & Puget Sound Railway Company has taken out a permit to practically rebuild its car and machine shops at 573 Railroad Avenue, which were destroyed recently by fire. The estimated cost of the proposed repairs is $9,000, the owner supplying the plans.

Hanford, Cal.—The bond of F. S. Granger in connection with franchise on Irwin and Sixth Streets, has been approved, with Joe D. Biddle and A. V. Taylor as sureties, and the ordinance awarding the franchise has been passed to the second reading.

San Francisco, Cal.—The public utilities committee of the Supervisors will recommend to the Board that a franchise to operate electric cars on Gough Street, from Market to McAllister, be advertised for sale, as petitioned for by the Fillmore Street Improvement Association.

Lewiston, Ida.—Engineer W. P. Wood, who arrived in the city recently, reports that the first grading contract on the Johnson road has been awarded to Contractor Swanson, who was one of the contractors on the Cul de Sac-Grangeville road. The contract awarded is for a mile of the grade between Dublin and Nez Perce.

Aberdeen, Wash.—The prospect is good for the building of the Grays Harbor & Puget Sound Railroad into the harbor, during the present summer. The County Commissioners have agreed to let the road have the needed right of way over the County Road, if it will give a guarantee of indemnity against all loss and damage.

Santa Ana, Cal.—The Pacific Electric Co. has made application to the City Council for a franchise to run a line from this city to the beet sugar factory, which is now being built at the corner of Main Street and Delhi Road. Franchise wanted is for steam, with provision that electricity may be used when occasion may demand.

Lakeview, Ore.—Right-of-way maps for the proposed road between Lakeview and the California line, in the road from Andersonville, on the Southern Pacific line in Sacramento Valley, to Lakeview, in Oregon, were filed in the United States Land Office at Lakeview, recently, by the Harriman interests. P. A. Worthington, of the Portland offices, filed the maps.

Alameda, Cal.—The Board of Town Trustees has granted the application of the Southern Pacific Company for the transformation of its steam lines in this city to electricity, and there is now every assurance that the much-desired change in power will soon be realized. It was necessary to adopt two separate ordinances to provide for the change, owing to the fact that the franchises were separately granted originally.

Portland, Ore.—Construction of the United Railways Company from Portland to Linnton and Hillsboro and Tillamook, has at last been officially determined upon, and will begin at once. At a meeting of members of the Seattle Dock Company with Portland members of the United Railways Company, held at the office of the latter in this city, plans were completed for the project and preliminary arrangements made.

Reardon, Wash.—The Idaho & Washington Northern Railway, which is now in operation as far as Newport, will within a few months resume work on the line to be constructed as far as Metaline, and it is expected that within a year, or at the most eighteen months, the line will be completed to the new mining district. Surveyors are at the present time working on either side of the Pend d'Oreille River, looking for the most feasible route down the river from Newport.

Spokane, Wash.—That W. A. Clark, of Butte, Mont., is planning to construct a railway through the Four-Mile country down into the old Buffalo Hump mining camp and down into Concord, where there are thousands of tons of ore blocked out awaiting transportation, is the gist of a report in circulation among Spokane mining men. It is said that Clark has had mining experts examining properties in the new district, where he recently acquired much property. The sale of the Sweeney interests in the camp is said to be incident to the deal.

Virginia City, Nev.—The electric locomotive to supplant mule power in operating cars in the Sutro Tunnel, will be installed the latter part of the current week, and will be in operation next week. It will materially facilitate the transportation of ore and waste from the mines to the surface. The Savage and Hale and Norcross have a large amount of ore blocked out above the tunnel floor, and Chollar and Potosi work on the tunnel level may soon develop ore known to exist above that level. The electric locomotive is equipped with a storage battery to furnish power for operating it.

San Francisco, Cal.—Assistant General Manager Scott, of the Southern Pacific, is authority for the statement that now that the franchises have been passed by Alameda, the work of converting the Alameda local to an electric line will be pushed hurriedly forward. Work will be started very soon, and the system, with its fourteen miles of line from the Alameda ferry slip through Alameda and on to Fruitvale, will be completed by the end of next year. Arrangements are shaping themselves for letting contracts for equipment for the Alameda electric, and sample car seats submitted indicate a style of cane-woven seat somewhat like, but an improvement on, the Key Route seats.

San Rafael, Cal.—The Trustees have decided that San Rafael will have a salt-water plant to supply all the water for sewers and street sprinkling. J. H. Dockwiler, employed by the city of San Francisco to examine the affairs of the Spring Valley Water Co., has been secured by the Trustees to appraise the property of the local water company, so that the city may oppose the claims of the corporation when the contest over the proposed cut in the water rate comes up in court.

FINANCIAL.

Globe, Ariz.—The City Attorney says that there will be no trouble for the city in issuing bonds for the purchase of water works or the construction of a sewerage plant.

Lodi, Cal.—The City Trustees have been enjoined from selling bonds in the sum of $76,000 for the water and light plant which were voted at the recent election. The Trustees are cited to appear before the Superior Court on August 5th, to show cause why they should not be permanently enjoined.

Oakland, Cal.—The Standard Oil Co., referred to as a corporation of Iowa and of California, was made defendant in a suit to recover $13,629.15, alleged commissions filed in the Superior Court last week, by F. D. Shields. The plaintiff says that he had an agreement with the oil company to sell cordage oil, used in the manufacture of rope, at a commission of two and one-half cents a gallon, and that he secured as a customer the Tubbs-Cordage Company with branches in San Francisco, Seattle and Portland. Deliveries of cordage oil alleged to have been made by the defendant corporation to the cordage plants following the signing of the alleged agreement in April, 1904, brought the total commissions up to the sum asked, according to the complaint, but Mr. Shields said that he had never been able to secure a settlement.

Sacramento, Cal.—The Northern Electric Railroad Company has filed its second annual report with the State Board of Equalization. It shows that the suburban railway has on hand revenue from its operations amounting to $21,987.44. The company filed the following statement: Length of system in State, 108.9 miles; value of entire roadway, roadbed and rails, $300,000; gross earnings from operation, $373,669.74; less operating expenses, $266,444.80; net income from operation, $107,-224.94; interest on funded debt, accrued, $85,237.50; surplus, $21,987.44.

Statements of other electric roads follow:

Ocean Shore Railway—Length of system in State, 23.30 miles; value of entire roadway, roadbed and rails in State, not given; system not yet in operation.

Vallejo, Benicia and Napa Valley Railroad—Length of system in State, 16,639 miles; value of roadway, roadbed and rails, $33,678; gross earnings from operation, $87,677.98; less operating expenses, $55,530.91; net income from operation, $32,-147.07; interest on funded debt accrued, $25,000; interest on interest-bearing current liabilities accrued, not otherwise provided for, $28; betterments, $16,746.26; total deductions from income, $41,774.26; deficit, $9,627.19.

San Francisco, Cal.—A daily paper reports that the United Railroads is negotiating for the purchase of the entire power plant of the Union Construction Co., of Vallecita, Calaveras County. The deal involves a sum in excess of $3,500,000, and when completed will put the local street railway company in control of a plant which will furnish 36,000 horsepower. This is greatly in excess of the amount of power needed to operate the street railway system. The remaining power will be sold to consumers. Patrick Calhoun, president of the United Railroads; Charles N. Black, general manager of the same company, and a bookkeeping expert are in Relief, one of the Union Construction Co.'s plants in the Sierras. Mr. Calhoun's trip was made with great secrecy. He announced that he was going deer hunting. Instead, he went by automobile to Sonora. With him was H. T. Jackson, assistant manager of the Union Construction Co., and several United Railroads officials. The party was taken to Relief, one of the highest camps on the company's property. There they commenced a minute inspection of the water supply and reservoir system, which will deliver 26,000 horsepower in San Francisco. Work on the plant is nearly completed, and the visit of the United Railroads officials is made with the object of buying the entire property outright. The figures which are under discussion are not made public, but it is known to be in excess of $3,500,000.

San Francisco, Cal.—City Attorney Long has, in response to a request from the City Engineer, prepared and submitted an opinion dealing with the question of future payments for Hetch-Hetchy lands, and the steps of procedure which in his opinion should lead up to the acquisition of the Elmer E. Smith property, which the city has already contracted to buy in order to avail itself of the grant made to it to use Government lands in the reservation as reservoir sites. The lands which the city has contracted to buy from private parties are valued at $165,800, which price the city has agreed to pay. Mr. Long holds that if the lands to be purchased were of less than $50,000 value, that the Board might proceed to purchase without submitting the proposition to a vote of the people, authority, he claims, being vested in the Board by the charter. In that the proposed expenditure exceeds that amount, it must be approved by the voters, unless the proposed expenditure can be met from the annual revenues of the city. Assuming that the revenues of the city are not sufficient to permit this, the City Attorney maps out the following course of procedure: First, passage of preliminary ordinance declaring the necessity of acquiring the water supply, calling for plans and estimates and designating the source of supply available; second, filing of plans and estimates; third, resolutions adopting plans and estimates; fourth, ordinance declaring that the proposed cost so far exceeds the annual revenues that a municipal bonded indebtedness must be incurred for the proposed acquisition (if such is the case); fifth, ordinance calling a special election to vote on the proposition. The Supervisors have been proceeding along the lines indicated by the City Attorney, and some time ago the declaratory ordinance was offered and approved by the Board. The plan is to follow the other steps as soon as they can be complied with, but in the meantime other payments will fall due, and the problem as to how they can be met is not in any way solved by the opinion of the City Attorney.

INCORPORATIONS.

Salinas, Cal.—The King City Water, Light & Power Co. has been incorporated here with a capital stock of $50,000, by C. P. Baird, W. S. Lierly, and L. B. Ulrey.

Brawley, Cal.—The Brawley Water Co. has filed articles of incorporation. Capital stock, $50,000; directors, H. C. Oakley, D. T. Jones, Geo. N. Turner, and others.

Bakersfield, Cal.—The Wallace Pump Co. has been incorporated here with a capital stock of $10,000, by T. A. Joy and Wm. Wallace, of Bakersfield, and D. Dougherty, of Kern.

Los Angeles, Cal.—The Corcoran Farms & Water Co. has been incorporated here with a capital stock of $100,000, by V. L. Denton, L. Butman, R. S. Bassett, J. W. Grainger, J. B. Walker, and others.

Los Angeles, Cal.—The West Coast Oil Co. has been incorporated here with a capital stock of $5,000,000, by W. S. Porter, E. H. Buck, W. F. Herrin, J. A. Chanslor, O. Scribner, B. E. Green, and M. H. Whittier.

El Monte, Cal.—The El Monte Home Telephone & Telegraph Co. has been incorporated here with a capital stock of $25,000, by J. S. Killian, F. P. Sappington, A. F. Snell, and I. Kauffman, of El Monte, and E. O. Fawcett, of Pasadena.

Prescott, Ariz.—Articles of incorporation have been filed for the Cataract Canyon Power Co., with $5,000,000 capital stock, to generate electric power, light and heat from the waters of Cataract Canyon, Mooney Falls, and other places on the Colorado River. The incorporators are: A. J. Head, E. H. Meek, Homer R. Wood, J. P. Dillon, and D. H. Biles.

TELEPHONE AND TELEGRAPH.

Willows, Cal.—The manager of the Glenn County Telephone Co. will apply for a franchise in the town of Willows.

San Francisco, Cal.—The Pacific Telephone & Telegraph Company has applied for a permit to erect a three-story building on Capp Street, near Twenty-fifth, to cost $31,950, and to be used as the Mission exchange.

San Francisco, Cal.—William Latt, as manager for the Hasty Special Messenger Co., 287 O'Farrell Street, has applied to the Board of Supervisors for permission to maintain wires in a district practically bounded by California, Larkin, Market and Kearny Streets.

San Francisco, Cal.—A change in the management of the Pacific Telephone & Telegraph Co. is soon to be inaugurated by Vice-President E. C. Bradley. The nine divisions into which the service of the company has heretofore been segregated are to be abandoned and in their place the "functional plan" of operation is to be adopted, with a commercial manager, a plant manager and a traffice manager in San Francisco, who report directly to Bradley. Each of these new officials will have under him three division superintendents—one in Los Angeles for Southern California, one in San Francisco for Central and Northern California, including San Francisco, and one in Portland for Oregon and Washington. Although the appointments to these twelve new positions will not be announced definitely by the company until Thursday, it is understood that G. B. Bush, who has been contract agent in San Francisco, will be the new commercial manager. J. P. Downs, the present traffic engineer, and traffic manager of the Rocky Mountain Tel. Co., with headquarters at Salt Lake City, will be plant manager. The three commercial superintendents, one in each of the three new Coast divisions, who will be under Bush, will, in all probability, be W. J. Phillips, John Kerns and C. M. Seeley. Seeley, who has formerly been division superintendent at Los Angeles, will remain in that city as commercial superintendent for Southern California; John Kerns, who is at present division superintendent in Oakland, will be commercial superintendent for the Northern California division, with headquarters at San Francisco, and W. J. Phillips, who has been general superintendent of the San Francisco office, will be transferred to Portland, where he will have charge of the commercial department for Oregon and Washington.

WATERWORKS.

Oroville, Cal.—The Big Bend Power Co. will have its line completed to Sacramento this week, and will be in a position to furnish power to San Francisco by October.

Red Bluff, Cal.—Alfred T. Forward has filed on 3,000 inches of water in South Digger Creek, in Sec. 19-30-3, to be used for generating electricity and to run a sawmill.

San Francisco, Cal.—The Globe Construction Co. is now ready to receive bids on the Oakland sub-station, to be erected for the Great Western Power Co. Bids will be received at 1409 Chronicle Building.

Redding, Cal.—Scott McArthur has filed notice of his appropriation of 100,000 inches of the running waters of Fall River, to be conveyed from near Manning's Falls by means of a canal and a tunnel, through the mountain to Pit River, near the falls in that stream.

Williams, Ariz.—An election will be held this week for the purpose of submitting the question as to whether or not a franchise for a water-works system, a sewerage system and electric light and power plant, shall be granted to Grand Canyon Electric Light & Power Co.

Tacoma, Wash.—Preliminary to developing power from American Lake, Lucian F. Cook and others have filed claims to water right. It is planned to flume the water from the west side of the lake to the water front, a distance of four miles, and to use it for operation of a power plant for generating electricity.

Santa Monica, Cal.—The City Council has recommended that George N. Tood be granted a franchise for erection of a wave-motor plant under condition that reinforced concrete piers to be built at Bay, Pier and the north of Montana Avenues, be seventy-five feet in width and 1,600 feet in length. The franchise is to include the privilege to erect hotels, bath-houses, and of erecting power plants, and to tunnel into bluffs or palisades along city parks of seashore in construction of marine chutes and subterranean museums. The estimated cost is $7,000,000, the basis for wave-motor system being $10,000 for each unit of 500 horsepower.

OIL.

San Francisco, Cal.—Announcement has been made of one of the largest deals of the year in California oil. By the terms of an agreement signed in this city the Associated Oil Co. has contracted to purchase from the Palmer Company, 2,000,000 barrels of oil at fifty cents a barrel. The company is the pioneer in a new field opened recently in the Santa Maria district. The company has drilled only one well, which is said to produce 2,000 barrels a day. It is understood that the control is vested with the Ladd interests of Portland, Ore. Victor Engineer, president of the Palmer Company, stated recently that his company already had begun to deliver oil on the contract. The fuel is sixteen and one-half gravity, and the price equals that paid for the same quality of petroleum in the Kern County fields. The new field opened by the Palmer Company is located eight miles east of the main oil-bearing territory in Santa Barbara County. It includes a number of independent holdings, but the bulk of the territory is controlled by the Union Oil Co., which purchased 4,000 acres from the Bell estate a few months ago.

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Keystone Boiler Wks., "Parker."
Standard Elect'l Wks., "Robb-Mumford."
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